AMENDMENTS TO THE CLAIMS

The listing of claims below replaces all prior versions of claims in the application.

1. (Previously Presented): A method for dissociating ions in a 3-D quadrupole ion trap composed of a ring electrode and a pair of end cap electrodes placed across the ring electrode, comprising the steps of switching a trapping voltage between two discrete DC voltage levels to create a digital trapping field for trapping precursor ions and product ions in a trapping region of the ion trap, and injecting electrons through a hole in one of the end cap electrodes into said ion trap while the trapping voltage is at a selected one of said two discrete DC voltage levels whereby injected electrons reach the trapping region with a kinetic energy suitable for electron induced dissociation to take place.

2. (Original): A method as claimed in claim 1 wherein the initial kinetic energy of the injected electrons is reduced to said kinetic energy suitable for electron induced dissociation to take place after the electrons have entered the ion trap.

3. (Cancelled)

4. (Original): A method as claimed in claim 1 wherein the electrons have a relatively low initial kinetic energy substantially suitable for electron induced dissociation, and are injected into said trapping region while the trapping voltage is at or close to zero volts.

5. (Cancelled)

6. (Previously Presented): A method as claimed in claim 1 including using a magnetic field to guide injected electrons to the trapping region.

7. (Original): A method as claimed in claim 6 wherein said magnetic field is generated using an electrical coil arranged to be energised by a pulsed current.

8. (Cancelled)

9. (Previously Presented): A method for dissociating ions in a 3-D quadrupole ion trap composed of a ring electrode and a pair of end cap electrodes placed across the ring electrode, comprising the steps of switching a trapping voltage between two discrete DC voltage levels to create a digital trapping field for trapping precursor ions and product ions in a trapping region of the ion trap, and injecting electrons through a hole or slit in the ring electrode of the ion trap into said ion trap while the trapping voltage is at a selected one of said two discrete DC voltage levels whereby injected electrons reach the trapping region with a kinetic energy suitable for electron induced dissociation to take place.

10-11. (Cancelled)

12. (Previously Presented): A method as claimed in claim 1 including introducing pulses of gas into the trapping region of the ion trap to cause collisional cooling of ions prior to or after dissociation.

13. (Original): A method as claimed in claim 12 wherein said pulses of gas are introduced into the trapping region using a pulsed valve and a vacuum pump capable of rapidly reducing the gas pressure to below 10^{-4} bar.

14. (Previously Presented): A method as claimed in claim 1 including applying a pulsed gate voltage to gating means to control extraction of electrons from an electron source for injection into said trapping region and synchronising application of said pulsed gate voltage with the step of switching said trapping voltage to said selected voltage level.

15. (Previously Presented): A method as claimed in claim 1 including applying a broadband dipole signal to the ion trap to remove product from the central region of the ion trap.

16. (Previously Presented): A method as claimed in claim 1 including applying an AC dipole signal to the ion trap to selectively excite the precursor ions.

17. (Previously Presented): A method as claimed in claim 1 wherein the trapped precursor ions include multiply-charged precursor ions, and the injected electrons have a kinetic

energy less than 1eV and are capable of inducing electron capture dissociation of said multiply-charged ions.

18. (Previously Presented): A method as claimed in claim 1 wherein the trapped precursor ions include multiply-charged precursor ions and including the step of introducing a gas into the trapping region of the ion trap whereby the injected electrons are captured by molecules of the gas and electrons are then transferred to the precursor ions to cause the dissociation.

19. (Previously Presented): A 3-D quadrupole ion trap composed of a ring electrode and a pair of end cap electrodes across the ring electrode, including switch means for switching a trapping voltage between two discrete DC voltage levels to create a digital trapping field for trapping precursor ions and product ions in a trapping region of the ion trap, a source of electrons and control means for causing source electrons to be injected through a hole in the end cap electrode into said ion trap while the trapping voltage is at a selected one of said voltage levels, whereby the injected electrons reach the trapping region with a kinetic energy suitable for electron induced dissociation to take place.

20. (Cancelled)

21. (Original): An ion trap as claimed in claim 19 wherein said electrons have a relatively low initial kinetic energy substantially suitable for electron induced dissociation to take place and the electrons are injected into said trapping region while the trapping voltage is at or close to zero volts.

22. (Original): An ion trap as claimed in claim 21 wherein said switch means is arranged to switch said trapping voltage between three discrete voltage levels and said control means is arranged to cause injection of said electrons into the trapping region while the trapping voltage has the lowest absolute voltage value.

23. (Previously Presented): An ion trap as claimed in claim 19 including means for generating a magnetic field for guiding injected electrons to the trapping region.

24. (Original): An ion trap as claimed in claim 23 wherein said means for generating a magnetic field comprises an electrical coil and means for energising the coil with pulsed current.

25. (Cancelled)

26. (Previously Presented): A 3-D quadrupole composed of a ring electrode and a pair of end cap electrodes across the ring electrode, including switch means for switching a trapping voltage between two discrete DC voltage levels to create a digital trapping field for trapping

precursor ions and product ions in a trapping region of the ion trap, a source of electrons and control means for causing source electrons to be injected through a hole or slit in the ring electrode of the ion trap into said ion trap while the trapping voltage is at a selected one of said voltage levels, whereby the injected electrons reach the trapping region with a kinetic energy suitable for electron induced dissociation to take place.

27-28. (Cancelled)

29. (Previously Presented): An ion trap according to claim 19 including a gas source for introducing pulses of gas into the trapping region to cause collisional cooling of ions prior to or after dissociation.

30. (Original): An ion trap as claimed in claim 29 wherein the gas source includes a pulsed valve and a vacuum pump capable of rapidly reducing gas pressure to below 10^{-4} bar.

31. (Previously Presented): An ion trap as claimed in claim 19 wherein said control means includes gating means, means for applying a pulsed gate voltage to said gating means to control extraction of electrons from a said source of electrons, and means for synchronising application of said pulsed gate voltage with the switching of said trapping voltage to the selected voltage level.

32. (Previously Presented): An ion trap as claimed in claim 19 including means for applying a broadband dipole signal to the ion trap to remove product ions from the central region of the ion trap.

33-36. (Cancelled)